

# Measurements of Thermodynamic Properties for the Propane + Isobutane System by the Burnett Method

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While global environment issues aggravate and many environment-friendly refrigerants are proposed, hydrocarbons including propane (R-290), isobutane (R-600a) and their binary mixtures are one of the most promising candidates as long-term alternative refrigerants for refrigeration and air-conditioning system. Hydrocarbons have zero ozone depletion potential (ODP) and negligible global warming impact (GWP), in addition to a fact that their theoretical cycle efficiency is satisfactorily high. In order to accomplish the optimum design of the system to achieve the best performance of the refrigeration cycle, it is needless to emphasize the importance of reliable thermodynamic property information about alternative refrigerants. However, there exists only a limited number of reliable thermodynamic property measurements. Especially, the available data for the binary R-290 + R-600a system are only limited in the liquid-phase and no PVTx property data are available in the gas-phase. Therefore, we aimed to measure the gas-phase PVTx properties and dew points for the binary system R-290 + R-600a by the Burnett-isochoric coupled method. In addition to the binary mixture, we also discussed thermodynamic properties for each single component. The present measurements cover temperatures 250-380 K, pressures up to 5 MPa and densities up to  $(1/2) \rho_c$  (critical density). On the basis of the present measurements, the vapor-pressure correlations and a truncated virial equation of state to cover the entire compositions have been developed.